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Young people with higher social anxiety struggle to adopt the perspective of another: Data from the Director Task

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Young people with higher social anxiety are less likely to adopt the perspective of another: Data from the Director Task

Short title: Adolescent anxiety and perspective taking

Keywords: Adolescent; Social Anxiety; Cognition; Mental Health; Social Perception; Social Skills

Abstract

Background and Objectives

Young people with social anxiety display poor social functioning but it is unclear whether this is underscored by difficulties in key social cognitive abilities, such as perspective taking. Here, we examined whether increased social anxiety is associated with reduced accuracy on a perspective taking task and whether this relationship is stronger at particular periods within adolescence.

Methods

Fifty-nine adolescents aged 11-19 years completed the computerised Director Task (DT) and the Social Anxiety Scale for Adolescence. In the DT, participants virtually move objects by following either instructions given by the 'Director' (who can see only some objects), or a simple rule to ignore certain objects.

Results

Participants who scored above the clinical cut-off for social anxiety (n=17) were less accurate when they had to take the perspective of the Director into account than those scoring below cut-off, yet performed similarly on control trials. Preliminary analysis indicated that poorer performance was most strongly associated with social anxiety in mid-adolescence (14 to 16.5 years).

Limitations

The DT has been used previously to measure online perspective taking but the underlying cognitive mechanisms have not been fully elucidated. Extending these findings using additional measures of perspective taking would be valuable.

Conclusions

Adolescents with higher social anxiety were less accurate at taking the perspective of a computerised character, with some suggestion that this relationship is strongest during mid-adolescence. If replicated, these findings highlight the importance of addressing specific social cognitive abilities in the assessment and treatment of adolescent social anxiety.

1. Introduction

Social anxiety is common in adolescence and many cases that onset in this age range persist into adulthood[1]. Social exchanges and relationships are integral to human life and social fears and worries that emerge during adolescence can yield impairment, distress and negative long-term outcomes, resulting in substantial economic costs for society[2]. For example, people with social anxiety have higher levels of unemployment[3], absenteeism from work[4] and reduced work productivity[5]. Frontline cognitive behavioural treatments for social anxiety in youth primarily target negative biases in cognitions about social situations (for example, interpreting an ambiguous situation negatively with thoughts such as "they are judging me"). As well as biased cognitive processing, some young people with social anxiety may have more basic difficulties in social understanding[6] that contribute to negative outcomes in social situations, and in turn drive social fears and worries[7]. Whilst there is a robust literature demonstrating a link between social anxiety and biased cognitions, less research has measured social understanding in social anxiety. From a therapeutic perspective, it is important to differentiate between cognitions about social performance that are biased compared to those that are founded in *actual* skill deficit. Indeed, young people with social anxiety may have a deficit in social skills – they are more likely to be disliked, neglected, and bullied, and have fewer and poorer friendships[8–15] (difficulties that appear to be specific to social anxiety rather than other anxiety disorders[9,14]). Studies using measures of self- and parent-report, as well as behavioural assessments, pinpoint problematic social skills, compared to their non-anxious peers[15–20], although a few studies have not replicated this association[21–23]. What is less clear is whether socially anxious adolescents also have difficulties in social cognitive abilities, which are cognitive skills that facilitate understanding of social situations, such as being able to adopt another's perspective. In this paper, we explored whether difficulty in taking the perspective of other people is linked to social

anxiety during adolescence. Moreover, as adolescence may reflect a period of protracted social learning and development, difficulties in social cognitive abilities in this age range could influence exposure to maladaptive social experiences and relationships – underscoring the need to target these early.

Social perspective taking is the ability to differentiate your own from another's mental state, and to use understanding of another's mental state to comprehend and predict that person's behaviour[24]. Consistent with this definition, proficiency in social perspective taking is associated with greater trust and a greater ability to adapt behaviour to others[25]. Preliminary data suggests that poor social perspective taking could be linked to social anxiety[6,26]. However, much of this research relies on self-, parent- or teacher-report[6] or the relationship has been indirectly inferred on the basis of observed negative peer experiences, such as bullying[26]. These do not rule out the possibility that the observed difficulties are confounded by existing negative social experiences. Experimental measures that present standardised scenarios across participants are needed to provide a more objective online measure of engagement in perspective taking. Studies using experimental measures to assess social cognitive skills more generally, have suggested an association with social anxiety in children. These have demonstrated that young people with social anxiety show reduced accuracy in recognising facial affect[27] and poorer understanding of faux pas scenarios which require more advanced mental state reasoning skills[6]. Emerging evidence therefore suggests that some young people with social anxiety may have an actual skills deficit.

Engagement in perspective taking refers to the idea that whilst the young person is often capable of taking another's perspective when explicitly told to do so; there may be individual differences in the extent to which young people employ this skill[28]. In this study we used the computerised Director task (DT) as an experimental measure of online perspective taking, to extend existing findings. This task has been used in a number of

studies[25,29,30] to assess how social cognitive capacities may vary across age in adolescence (although see Santiesteban et al[31] for alternative accounts of what this task measures). Engagement in perspective taking ability could be influenced by motivational and state factors, for example feeling socially anxious or worrying is likely to increase the person's focus on themselves[32] and so reduce engagement in perspective taking. A computerised task is advantageous as, whilst it cannot eradicate the influence of state anxiety (and therefore self-focus) on performance, it can reduce it to a greater degree than other measures, such as observational tasks. An additional advantage of this task is that both accuracy and reaction time (RT) are measured. Although accuracy could offer an overall indication of difficulty with perspective-taking, under circumstances where participants are able to derive the correct response through compensatory effortful mental strategies, no differences may be apparent on overall accuracy. In contrast, RT on these correct trials may capture more subtle differences in how automatically or efficiently information is processed (when accuracy is prioritised).

As well as aiming to explain why some young people experience social anxiety, we were interested to explore whether the link between social cognitive difficulties and social anxiety changes with age across adolescence. A variety of significant changes occur during adolescence, including changes in cognitive processing. For example, during adolescence the degree to which young people think about their own thoughts (i.e. meta-cognition), and the thoughts of others, increases[33,34]. These changes, which are likely to be supported by maturing neural circuits, are proposed to be adaptive as social situations and networks become more complex and hierarchical during adolescence[35]. Indeed, previous studies using the Director task have reported age-typical improvements[30]. These age typical improvements may serve to magnify or draw focus to adolescents who do not make the same improvements in their social cognitive abilities and so who may experience social anxiety as a result. Specifically, for the majority of adolescents, gradual improvements in perspective taking

ability during adolescence may improve their awareness that everyday social situations are often intricate and ambiguous[35] and allow them to 'fine-tune' responses to complex interpersonal situations. However, for others who experience a slower age-associated improvement in perspective-taking, the increased complexity of social networks may result in everyday social situations seeming confusing and challenging. 'In this subset of adolescents, changes in perspective-taking ability could instead increase social fears, potentially explaining why many cases of social anxiety onset at puberty or during adolescence. It may, therefore, be possible that individual differences in social cognitive ability are associated with social anxiety at different stages of its developmental trajectory. Tentatively, we explored here whether this relationship is stronger at later stages of adolescence. So, we investigated not only age-associated changes in perspective taking, but also whether the relationship between social anxiety and perspective taking could be stronger at later stages of adolescence.

In summary, we explored two sets of questions. Our primary hypothesis was that youths scoring above clinical cut-off for social anxiety, compared to those scoring below cut-off, would demonstrate reduced accuracy (and possibly RT) on a measure of social perspective taking. Second, as well as replicating previous findings that young people more automatically take account of another person's perspective with increasing age[24,36] (i.e. become quicker and more accurate), we explored a new hypothesis: that the link between perspective-taking and social anxiety changes with age in adolescence. Here, we predicted that the association strengthens with age as social cognitive abilities improve.

2. Materials and Methods

2.1 Participants and Procedure

Fifty-nine (32 female) adolescents between age 11 and 19 years ($\overline{x}$= 15.26; SD= 2.08) completed the experimental task first followed by the questionnaire after a short break. Both

were completed individually in a quiet room. Participants and their guardians did not self-report any history of psychiatric disorder. All participants were fluent in English. Participants were recruited via advertisements in Oxford University's newsletter and from schools in Oxford or London. Ethical approval was obtained from the University of Oxford Central Research Ethics and informed consent provided by all participants and their parents.

2.2. Measures

2.2.1. The Director Task (DT; Keysar et al., 2000[37]).

Participants completed the DT to assess social perspective taking abilities. Dumontheil et al.[30] adapted the adult version of the DT[37,383] for presentation on a computer and for use with young people. The task consisted of two conditions (Director, No-Director) and three trial types (experimental, control, filler). On all trials, participants viewed a 4x4 set of shelves containing eight objects. Participants were asked to listen to standardised instructions through headphones and move one of the eight objects around the grid in a particular direction by clicking on the object with the cursor and dragging it to the appropriate slot.

In the Director condition, participants were instructed to move certain objects around the grid by the 'Director'. The Director was standing on the other side of the shelves and five slots were occluded from his view by grey boards, i.e. the Director could see some but not all objects visible to the participant. On the critical trials (Director, experimental), the participant needed to ignore the object that best fit the description from their own perspective ('distractor object') and move the object that best fit the description from the Director's perspective. For example, if the instruction was to "move the smallest ball to the right", and the shelves displayed three balls but the smallest ball (which best fits the description) was only visible to the participant, whilst the other two balls (middle sized and large balls) were visible to both

the Director and participant, the 'correct' response was to move the middle-sized ball. On control trials, the objects were arranged identically to the experimental trials but an irrelevant object replaced the distractor object (i.e. the small ball in the last example). As these trials did not require participants to inhibit a pre-potent response to move the object according to the participants' own perspective, they were used to control for differences in general accuracy and response times to a given instruction. The No-Director condition measured participant responses to an instructed rule and was designed to further control for executive functioning and inhibitory control. In this condition, participants were informed that the Director had gone and were asked to follow the rule: ignore the objects in grey slots. Both the Director and No Director conditions contained experimental, control and filler trials with trial order counterbalanced between subjects. In the filler trials, instructions only referred to objects not in the occluded/grey slots; these trials were excluded from any analysis.

There were two sets of eight different shelf-object configurations: one set presented in the Director condition and the other in the No Director condition. The sets were counterbalanced between participants. For each shelf configuration, the shelf was presented for two seconds before three auditory instructions were given: two filler instructions and one control or experimental instruction. Each instruction lasted 2.2 seconds and participants given 3.6 seconds to respond. Each condition lasted approximately 5.5 minutes. The Director condition was always completed before the No-Director condition so that participants did not apply the strategy from the No-Director condition (i.e. ignore objects in grey slots) to the Director condition. Before starting the task, participants were given standardised instructions with an example for each condition.

2.2.2 Social Anxiety Scale for Adolescence (SAS-A, LaGreca & Lopez, 1998[39]).

The SAS-A is a reliable and valid measure of social anxiety in young people aged seven to nineteen[39]. It is a 22-item self-report measure scored on a 5-point Likert scale (1=

never to 5= all the time) with eighteen descriptive self-statements (e.g., "I feel shy around people I don't know") and four filler items (e.g., "I like to read") that are not included in the total score. It is an established screening instrument to identify clinically significant levels of social anxiety in adolescent community samples, with a recommended cut-off score of between 50 and 54[40,41]. In this study we used a cut-off score of 51 to maximise the number of participants in each group (however, using different cut-offs gives a similar pattern). Previous studies have demonstrated good internal consistency and modest test retest reliability[39]. The SAS-A has been found to be a better predictor of Social Anxiety Disorder than other similar scales[42] and to correlate highly with other measures of social anxiety (e.g. Social Phobia and Anxiety Inventory), demonstrating good convergent validity[39,43,44]. In the current study, the internal consistency of the scale was good (Cronbach's α = .89). Scores ranged from 26 to 74 ($\bar{x}$= 46.15, SD= 12.16). Scores on this measure were in the expected range for a community sample, according to previous studies[41,43].

2.3 Data analysis

The DT had two main outcome variables: accuracy and response time (RT). Accuracy for each participant was calculated as the percentage of correctly responded trials in each Condition (Director/No-Director) for each Trial type (Control/Experimental). Mean RTs for correctly completed experimental and control trials were calculated for each participant.

To assess the relationship between social anxiety, age and social perspective taking ability, accuracy and reaction time were analysed independently using 2x2x2 repeated-measures ANCOVAs. Condition (Director/No-Director) and Trial type (control/experimental) were the within subject factors, Social anxiety group (below cut-off/ above cut-off) were the between subjects factor and Age was the covariate. Interactions were then decomposed using further repeated-measures ANOVAs, ANCOVAs, correlations and t-tests. In follow-up analyses, No-Director experimental trials, rather than Director control

trials, were used as the control condition for Director experimental trials. This is because they are more appropriately matched for demands on inhibitory control, as well as other elements of the task such as the stimuli and complexity of the instructions.

Exploratory analysis investigated the relationship between social anxiety scores and task performance (accuracy and RT) for three different age groups. Participants were divided into three age groups that each contained roughly a third of the sample (as has been done in previous studies[30]) and reflected key developmental time points: early adolescence (11-13.9 years; n=19), mid-adolescence (14-16.5 years, n=19) and late-adolescence (16.5-19 years, n=21). We then used partial correlations to investigate the relationship between performance on the Director experimental condition and social anxiety for each age group, controlling for performance on the Director control condition. A two-tailed significance level of α=0.05 was used throughout the analysis and effect sizes were reported.

3. Results

3.1 Social Anxiety

Seventeen (29%) participants scored above clinical cut-off for social anxiety according to the SAS-A (below cut-off: $\bar{x}$= 39.67; SD= 6.08; above cut-off: $\bar{x}$= 62.16; SD= 7.62). Chi-squared analysis revealed no significant difference in gender between those scoring above and below cut-off ($\chi^2(1)= .30$, $p>0.05$). However, those scoring above cut-off for social anxiety were significantly older than those scoring below ($t(57)= -2.26$, $p<0.05$).

3.2 Accuracy Data: social anxiety and age effects

In the 2x2x2 repeated measures ANOVA for accuracy, the two main effects, as well as several two and three-way interactions, were significant (for a summary of the analysis **see table 1a)**. Participants were more accurate in the No-Director than the Director condition, $F(1,56)= 62.03$, $p<0.05$, $\eta_p^2 =.53$. They were also more accurate in control than experimental

trials, $F(1,56)= 83.24$, $p<0.05$, $\eta_p^2 =.60$. There were significant two-way interactions between Condition and Trial type, $F(1,56)= 47.82$, $p<0.05$, $\eta_p^2 =.46$; Trial type and Age, $F(1,56)= 11.94$, $p<0.05$, $\eta_p^2 =.18$; and Trial type and Social anxiety group, $F(1,56)= 7.41$, $p<0.05$, $\eta_p^2 =.12$. Decomposing the Condition by Trial type interaction, we found that for experimental trials, participants were less accurate on the Director than the No-Director trials, ($t(58)= -9.07$, $p<0.05$, $r=.77$) with no significant difference between the two control trials ($t(58)= -2.07$, $p>0.05$).

The Trial type by Age interaction was followed up by investigating age effects for each Trial type (collapsed across condition). This revealed significant correlations between age and accuracy on the experimental Trial types ($r(57)= .36$, $p<0.05$) whilst the relationship between age and accuracy on the control trials types was not significant ($r(57)= 0.094$, $p>0.05$; 34 of 59 participants scored at ceiling on the control trial).

The Trial type and Social anxiety interaction was further moderated by Condition, as there was a significant three way interaction between Condition, Trial type and Social anxiety group, $F(1,56)= 4.67$, $p<0.05$, $\eta_p^2 =.077$. We decomposed this interaction by running ANCOVAs with Condition (Director/No Director) as the repeated-measure and Social anxiety as the between subjects variable, for each Trial type separately. As there were mean age differences across Social anxiety groups, Age was again included as a covariate in this analysis. This revealed a significant main effect of Condition, ($F(1,56)= 88.24$, $p<0.05$, $\eta_p^2 =.61$) and a significant interaction between Condition and Social anxiety group ($F(1,56)= 4.48$, $p<0.05$, $\eta_p^2 =.074$) but not Condition and Age ($F(1,56)= 3.95$, $p=0.052$) in the experimental, but not the control trials (Condition, $F(1,56)= 2.52$, $p>0.05$; Condition x Social anxiety $F(1,56)= 0.084$, $p>0.05$; Condition x Age $F(1,56)= .31$, $p>0.05$). The significant interactions in the experimental trials were followed up using ANCOVAs with accuracy as the dependent variable, Social anxiety group as the between subjects factor and Age as a

covariate for each Condition separately. This revealed significant differences between the Social anxiety groups in accuracy on the experimental Director trials ($F(1,56)= 7.64$, $p<0.05$, $\eta_p^2 =.12$) but not the No Director trials ($F(1,56)= .74$, $p>0.05$) **(see figure 1)**. Participants who scored above cut-off for social anxiety were less accurate on the Director experimental trials ($\bar{x}= 36.03$; SD= 32.44) than those who scored below cut-off ($\bar{x}= 53.53$; SD= 35.02). Age was significantly associated with accuracy in the Director ($F(1,56)= 10.50$, $p<0.05$, $\eta_p^2 =.16$) and No Director ($F(1,56)= 4.20$, $p<0.05$, $\eta_p^2 =.07$) conditions.

3.3 Response time: social anxiety and age effects

The above 2x2x2 repeated measures ANOVA was repeated using mean RTs. Only RTs to correctly responded trials were included and those subjects who had no correct response in one of the four conditions were excluded. This resulted in a sample size of 49 participants. This analysis indicated no main or interaction effects **(**see **table 1b** for a summary of the analysis**).**

3.4 Exploratory analysis: the effects of social anxiety in each age group on task performance and response time

Increases in social anxiety significantly correlated with decreases in accuracy on the experimental Director trials (after controlling for performance on experimental No Director trials) only in the mid-adolescence age group (early adolescence: $r(16)= -.060$, $p>0.05$; mid-adolescence: $r(16) = -.49$, $p<0.05$; late-adolescence: $r(18)= -.24$, $p>0.05$, see **Figure 2**). A similar negative association between social anxiety and accuracy was present in both the mid and late adolescent group (albeit non-significant in the late adolescent group). This relationship was not observed in the early adolescent group. There was no significant difference between the age groups in social anxiety, $F(2,56)= 0.481$, $p>0.05$, however this may be due to the small sample size in each age group. Of note, when the analysis was

repeated to replicate age groupings from a previous study[30], a similar pattern of results was identified. These differential patterns of correlation between social anxiety and task performance in each age group did not characterise response time data.

4. Discussion

The current study used an experimental task to test whether accuracy on a social perspective-taking task is associated with social anxiety. Our results demonstrate that young people who scored above clinical cut-off for social anxiety made more errors on trials where they had to take the perspective of the Director into account. There were no differences in response times. These results contribute to our understanding of why some young people with social anxiety struggle with social skills and social functioning. Performance on the experimental trials continued to improve with age, and there was no association with age and accuracy on the control trials. Additionally, we found preliminary evidence that the link between social anxiety and social perspective may emerge during mid-adolescence. These findings need replication but speculatively suggest that, as social cognition develops, it may carry differential risks for social anxiety at different stages in this maturation process.

Our findings imply that young people with social anxiety are less accurate at perspective taking as measured by the Director Task. This is consistent with previous experimental studies that have suggested young people with social anxiety may have deficits in social cognitive skills[6,27]. What our data cannot tell us is the direction of the effect, whether these difficulties in perspective taking also drive negative peer experiences, and how they shape or interact with biased cognitions. It may be that these difficulties are not related, and that there are distinct routes to social anxiety – with some individuals maintaining biased representations of the social world, and others struggling with social understanding. It may also be that the presence of both cognitive factors greatly increases social anxiety – or that the

presence of one attenuates the other e.g. better social cognitive understanding reduces the effects of biased cognitions.

Our second set of exploratory findings relates to how typical developmental changes may enable new social anxiety correlates to be expressed. Whilst engagement in perspective taking continues to improve with age, our data tentatively imply that the negative association between accuracy and social anxiety emerges during mid-adolescence. Given the small sample size in each age group, and as very few studies have investigated changes in the cognitive correlates of social anxiety across development, our findings need replication in a larger sample where analysis using appropriately powered ANCOVAs can be utilised. A larger sample would also be helpful to establish whether the similar but non-significant relationship observed in the late adolescent group is due to sample size or because the relationship is actually weaker in late adolescence. It is interesting to note that there is some existing evidence that biased cognitions, such as negative interpretational style, may only correlate with symptoms in adolescence and not in childhood[45], and moreover, that with increasing age, selective attention biases for threat become more strongly associated with anxiety[46]. Together these findings may suggest that relationships between cognitive variables and social anxiety emerge during mid-adolescence when these cognitive variables are relatively more developed, but also when the social world becomes more complex and important. For most young people, this age-associated improvement in perspective taking may mean that they are increasingly able to navigate this complex social world whilst, for a minority, a slower improvement in accuracy with age may lead them to become aware that they have not yet developed the appropriate skills to navigate social situations. As young people are likely to form powerful mental representations of themselves as social agents in this phase of adolescence, if these are negative, social anxiety and avoidance of social situations could emerge.

If replicated, these findings could have significant clinical implications. A major component of current frontline treatments for social anxiety is to modify biased cognitions about social performance (e.g. 'people will not like me'). This often involves exposing the person to social situations and observing the consequences. These techniques are grounded in the assumption that the person has intact social skills but processes social information in a maladaptive way. However, if adolescents with social anxiety do have actual difficulties engaging in social perspective taking, then this may reduce their ability to elicit positive social interactions and could offer one explanation for the impaired social functioning documented in young people with social anxiety[8–15]. This is in line with previous research which demonstrates, for example, that video feedback is only beneficial for those participants who are socially skilled[47,48], and may partly explain recent findings that CBT is less effective for young people with social anxiety compared to other anxiety disorders[49]. The current data suggest that individual assessment of social skills is important and that the appropriate intervention may vary for different age groups.

We did not find the expected relationship between age and RT (or between RT and the different conditions/trial types) that previous research has found. Previous research has indicated that participants are (1) slower in the No Director than Director condition and slower on control rather than experimental trials and that (2) response time decreases with increasing age[30]. There are a number of possible explanations for this lack of replication of previous studies, including having a smaller sample size and a narrower age range than previous studies[30]. Previous findings that RTs were significantly longer for younger compared to older participants were driven by differences between the youngest (age 7.3 to 9.7) and the older adolescent and adult age groups. Our study did not include the youngest or adult age groups – perhaps explaining these discrepant findings. We also did not find a relationship between RT and social anxiety group. A longer RT to correct responses (i.e.

when accuracy is prioritised) during the director experimental trials in the social anxiety group could indicate that other cognitive processes (such as worry) may have affected the efficiency or mental effort with which information was processed. A subtle difficulty in social cognitive ability, where the young person struggles to engage in perspective taking but compensates for this with additional effort and strategies, might be reflected in differences in RT rather than accuracy. Therefore, the finding that those with high socially anxiety were not taking longer to respond accurately but are responding less accurately implies more overt difficulties with social cognitive ability.

This study has several limitations. The cross-sectional nature of this study means that we cannot understand temporal links between perspective taking and social anxiety. The analogue sample used here means also that there is limited generalizability to clinically anxious populations. Furthermore, performance on the task could be influenced by other factors, such as state anxiety increasing self-focus. Although we attempted to minimise the influence of state anxiety by using a computerised task, future studies could usefully include a measure of state anxiety and attentional focus. We also did not include measures of IQ or social competence. The former would be valuable to exclude any confounding effect of intellectual ability on the relationship and the latter to add ecological validity to the measures.

Another limitation is the validity of the DT. Although it has been used in previously as a measure of perspective taking in online social interactions[25,30,38], concerns have been raised over whether DT measures a specifically social ability (i.e. theory of mind – the ability to impute mental states to oneself and others[50]). Some argue that the task measures visuo-spatial manipulations that do not require the use of mentalising – instead reflecting more general cognitive processes that are also implicated in social cognition[31]. However, neuroimaging research has demonstrated that during the Director condition, social brain regions are activated whilst brain regions associated with visuo-spatial tasks are not[51]. The

association with social variables e.g. trust and reciprocity[25] lends further weight to the suggestion that it is offers a measurement of variables relevant to social perspective taking. Nonetheless, given this controversy, future studies should extend these findings to other experimental measures of social perspective-taking and further validate these with behavioural assessments and reports of this capacity.

5. Conclusion

The current study found an association between higher social anxiety and reduced perspective taking. If young people with social anxiety do struggle with perspective taking, it would have implications for the content of therapeutic interventions. Current gold standard psychological interventions assume that biased cognitions characterising social anxiety are distortions of reality and can be modified by, for example, exposure to social situations. However, our current findings would suggest that teaching core skills of social cognition, such as perspective taking, may be useful in supplementing cognitive techniques.

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Table 1: Analysis using a repeated measures ANOVA to investigate the relationship between age, social anxiety and (1a) accuracy on the DT or (1b) response times in the DT.

Table 1a

ACCURACY	**F**	**p**	η_p^2
Condition (Director/No Director)	F (1,56) = 62.03	p <0.05	η_p^2 =.53
Condition *age	F(1,56) =1.70	p >0.05	
Condition*social anxiety group	F(1,56) = 1.56	p >0.05	
Trial Type (experimental/control)	F(1,56) = 83.24	p < 0.05	η_p^2=.60
Trial type*age	F(1,56) = 11.94	p <0.05	η_p^2= .18
Trial type*social anxiety group	F(1,56) = 7.41	p <0.05	η_p^2= .12
Condition*Trial type	F(1,56) = l47.82	p <0.05	η_p^2 =.46
Condition*Trial type*age	F(1,56) = 3.52	p = 0.066	
Condition*Trial type*social anxiety group	F(1,56) = 4.67	p <0.05	η_p^2 = .077

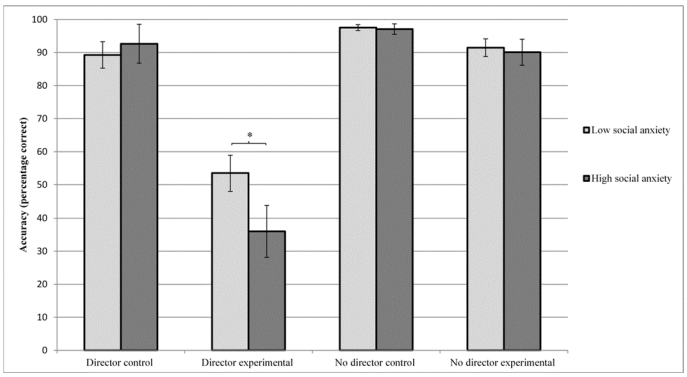
Table 1b

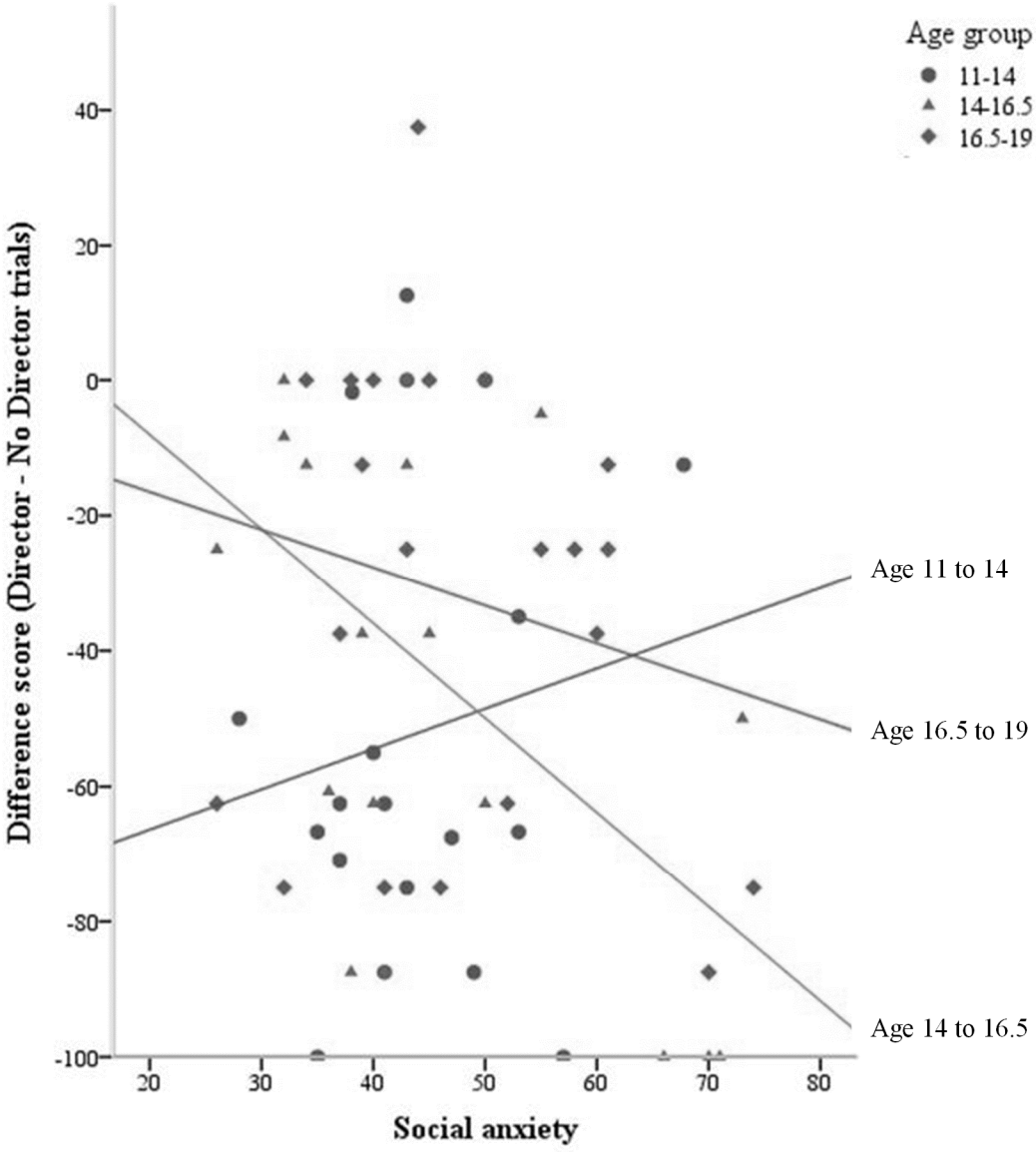
RESPONSE TIMES	**F**	**p**
Condition (Director/No Director)	F(1,44) = 1.90	p >0.05
Condition *age	F(1,44) = 0.17	p >0.05
Condition*Social anxiety group	F(1,44) = 0.49	p >0.05
Trial Type (experimental/control)	F(1,44) = 0.97	p >0.05
Trial type*age	F(1,44) = 0.55	p >0.05
Trial type*Social anxiety group	F(1,44) = 0.92	p >0.05
Condition*Trial type	F(1,44) =0.79	p >0.05
Condition*Trial type*age	F(1,44) = 0.79	p >0.05
Condition*Trial type*social anxiety group	F(1,44) = 2.45	p >0.05

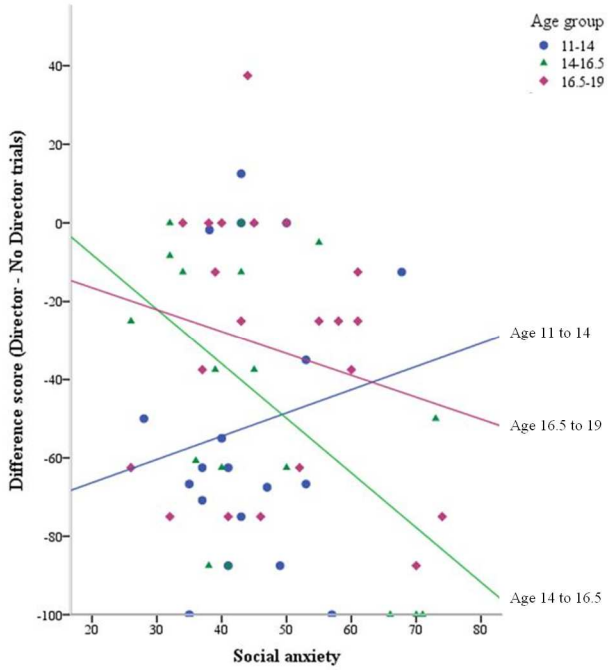
Figure Legends

Figure 1: Accuracy on each Condition (Director; No Director) and Trial type (experimental; control) for those scoring above and below clinical cut-off for social anxiety. *$p<0.05$ (between those scoring above and those scoring below clinical cut-off on the Director experimental condition).

Figure 2: The relationship between social anxiety and difference in accuracy on the Director and No Director experimental trials for three adolescent age groups.




Age group
11-14
14-16.5
16.5-19
Difference score (Director - No Director trials)
40
20
0
-20
-40
-60
-80
-100
20
30
40
50
60
70
80
Social anxiety
Age 11 to 14
Age 16.5 to 19
Age 14 to 16.5



Highlights: Adolescent Anxiety and Perspective Taking

1. Accuracy on trials requiring social perspective taking improved with age.
2. Those with high social anxiety engaged less in online social perspective taking.
3. Performance on control trials did not differ between social anxiety groups.
4. The relationship between anxiety and accuracy was strongest in mid-adolescence.